REMARKS

Claims 1-9, all the claims pending in the application, stand rejected. Claims 1 and 6 are amended. Claims 2 and 9 are cancelled. The limitations of claim 2 have been added to claim 1.

Claim Objections

Claim 1 is objected to because the Examiner asserts that "at least one copper pool phases" should be changed to "at least one copper pool phase". Appropriate correction has been made.

Claim Rejections - 35 USC § 112

Claims 6 and 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. This rejection is traversed for at least the following reasons.

The Examiner notes that claim 6 recites the limitation "the step of infiltrating copper or a copper alloy." The Examiner asserts that there is insufficient antecedent basis for this limitation in the claim. Claim 7 is rejected because it depends from a rejected base claim.

Applicants have amended claim 6 to remove this basis for rejection.

Claim Rejections - 35 USC § 103

Claims 1-4, 6-7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kashiwagi al. (US 4,640,999). This rejection is traversed for at least the following reasons.

Claim 1

The present invention provides a Mo-Cu composite material including a Mo-Cu composite phase and at least one copper pool phase formed in the Mo-Cu composite phase.

Layer Structure

The copper pool phase(s) serve as copper layer(s) that are included within the Mo-Cu based alloy, specifically, such that the copper layers are stacked with Mo-Cu composite layers to form a stacked structure of the Mo-Cu composite layers and the copper layers. The at least one copper pool phase can control the function of the matrix of the composite material as described in the second and third paragraphs at page 10 of the original application. In addition, the composite material, including at least one copper pool phase, raises a Young's modulus up to at least 15 MPa, which is 10% higher than that of a composite material that does not include any

copper pool phase, as described in the paragraph bridging pages 18 and 19 of the original specification, in connection with Fig. 5.

Grain Size

According to the disclosed embodiments of the present invention, the compressed or pre-sintered body includes a molybdenum powder and a copper powder. The molybdenum powder has a grain size of 1 to 10μm while the copper powder has a grain size of 50μm or more. Clearly, the grain size of copper powder is larger than that of the molybdenum powder.

Claim 1 has been amended to add the limitation that "the at least one copper pool phase has an average short diameter of 50 to 200 μm," as originally recited in claim 2. Further, claim 1 is amended to state that "the at least one copper pool phase has a grain size larger than the molybdenum particles forming the Mo-Cu composite material."

These added limitations to grain size are not found in the cited art.

Kashiwagi

Examiner states on page 3, lines 11 to 16 of the Office Action that Kashiwagi et al. discloses a contact material having a composition similar to the present invention, and asserts that Kashiwagi et al further specifies that metal particles would be uniformly distributed (column 4, lines 14 -22) and the particle size of each metal would be -100 meshes (less than 149 μm) on column 4, lines 14 -22. The Examiner asserts that in Kashiwagi et al, the copper-molybdenum-chromium composite would be expected to contain at least one pool phase in an amount of 10 to 50 weight percent and an average short diameter of 50 to 200μm, and a Mo-Cu composite phase.

As now defined in amended claim 1, the compressed or pre-sintered body includes a molybdenum powder and a copper powder. The claim expressly states that that "the at least one copper pool phase has an average short diameter of 50 to 200 μm" and that "the at least one copper pool phase has a grain size larger than the molybdenum particles forming the Mo-Cu composite material."

On the other hand, in Kashiwagi et al., a Cu-Mo composite material is made by infiltrating a sintered material with a molten copper metal. The sintered body having a porous matrix is formed by sintering a compact material . The compact material contains a Mo powder having a grain size of less than 149μm and a chromium powder. In the compact material or sintered material, a space, such as gap and void, between the molybdenum particles can not

become larger than the grain size of the molybdenum particles and would be thought to be about 20 to 30μm. Thus, the copper phase infiltrated in the space has a diameter of 149 μm or less and a grain size similar to Mo particles, which can not be a Cu pool phase according to the present invention. Accordingly, in Kashiwagi et al, no copper pool phase can be produced in the composite material.

By contrast, according to the present invention, the composite material includes a Mo-Cu composite phase and at least one copper pool phase. The at least one pool phases are made by infiltrating a compressed body or pre-sintered with molten Cu at a portion where grains of copper powder are contained, as described at the paragraph bridging pages 13 and 14 of the original application.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kashiwagi et al. (US 4,640,999) alone, or alternatively with evidence from Sakuma et al. (US 4,661,666). This rejection is traversed for at least the following reasons.

The Examiner admits that Kashiwagi does not specify that the vacuum interrupter would be a heat sink member, and looks to Sakuma et al for such teaching.

Sakuma et al

Sakuma et al. discloses that vacuum interrupters would dissipate heat from a coil (col. 1, lines 18-38) as Examiner points out.

However, Sakuma et al. neither teach nor suggest that a Mo-Cu composite material includes at least one copper pool phase having a grain size larger than the molybdenum particles forming the Mo-Cu composite phase and an average short diameter of 50 to 200 μm.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kashiwagi et al. (US 4,640,999) alone, or alternatively with evidence from Sakuma et al. (US 4,661,666) as applied to claim 5 above, and further in view of Isberg et al. (US 6,239,514). This rejection is traversed for at least the following reasons.

The Examiner admits that Kashiwagi et al. alone, or alternatively with evidence from Sakuma et al. do not specify that the vacuum interrupter would be used in a semiconductor apparatus. The Examiner looks to Isberg et al for this teaching.

Isberg et al

Isberg et al. discloses that using a vacuum interrupter in a semiconductor device.

However, Isberg et al. neither teach nor suggest that a Mo-Cu composite material includes at least one copper pool phases having a grain size larger than the molybdenum particles forming the Mo-Cu composite phase and an average short diameter of 50 to 200 μm.

Claims 3-8

These claims would be patentable for the reasons given for claim 1.

Conclusion

Applicants respectfully submit that the present invention as defined by claim 1 is not taught from Kashiwagi et al., Sakuma et al., and Isberg et al. either alone or the combination thereof.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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